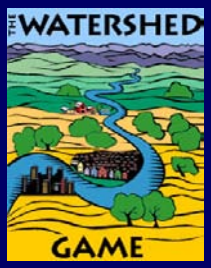
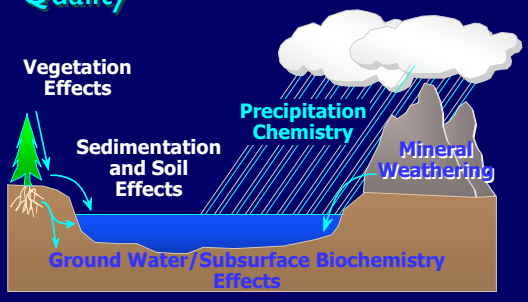
Introduction to Watershed Plans

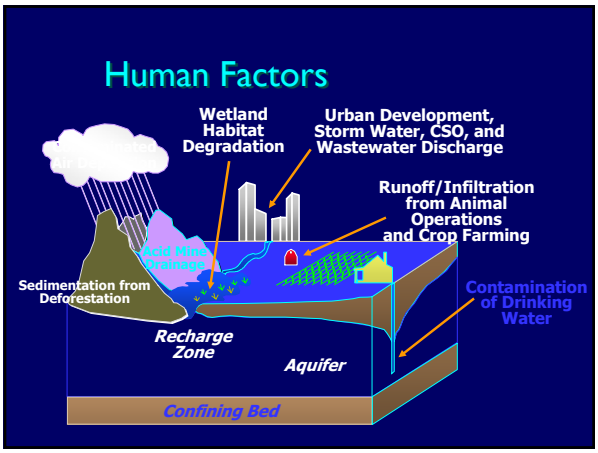


Barry Tonning
Tetra Tech

Watersheds

Natural Factors Affecting Water Quality




Human Factors
Wetland Habitat Degradation
Urban Development, Storm Water, CSO, and Wastewater Discharge
Runoff/Infiltration from Animal Operations and Crop Farming
Acid Mine Drainage
Sedimentation from Deforestation
Contamination of Drinking Water
Recharge Zone
Aquifer
Confining Bed


A watershed approach helps to...
1. Encourage Sound Science
2. Facilitate Communication and Partnerships
3. Provide Means of Cost-Effective Management
4. Focus on Environmental Results

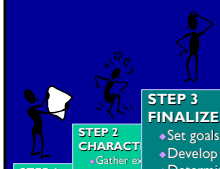

Watershed Planning Steps
STEP I
BUILD PARTNERSHIPS
ID stakeholders
ID issues of concern
Set preliminary goals
Develop indicators
Conduct outreach

Watershed Planning Steps

STEP 2
CHARACTERIZE WATERSHED
- Gather existing data
- Create data inventory
- ID data gaps
- Collect additional data, if needed
- Analyze data
- ID causes and sources
- Estimate pollutant loads

STEP 1
BUILD PA
- ID stake
- ID issue
- Set preli
- Develop
- Conduc

Watershed Planning Steps



STEP 3
FINALIZE GOALS AND IDENTIFY SOLUTIONS
- Set goals and management objectives
- Develop indicators/targets
- Determine load reductions needed
- ID critical areas
- ID management measures needed

STEP 2
CHARACT
- Gather ex
- Create da
- ID data ga
- Collect ad
- Analyze d
- ID causes
- Estimate p

STEP 1
BUILD PA
- ID stake
- ID issues
- Set preli
- Develop
- Conduct

Watershed Planning Steps

STEP 4
DESIGN IMPLEMENTATION PROGRAM
- Develop Implementation schedule
- Set Interim milestones
- Determine how you will measure success
- Develop monitoring component
- Develop evaluation process
- ID technical and financial assistance needed
- Assign responsibility

STEP 3
FINALIZE GO
- Set goals and
- Develop indi
- Determine lo
- ID critical ar
- ID manageme

STEP 2
CHARACT
- Gather e
- Create d
- ID data g
- Collect a
- Analyze
- ID cause
- Estimate

STEP 1
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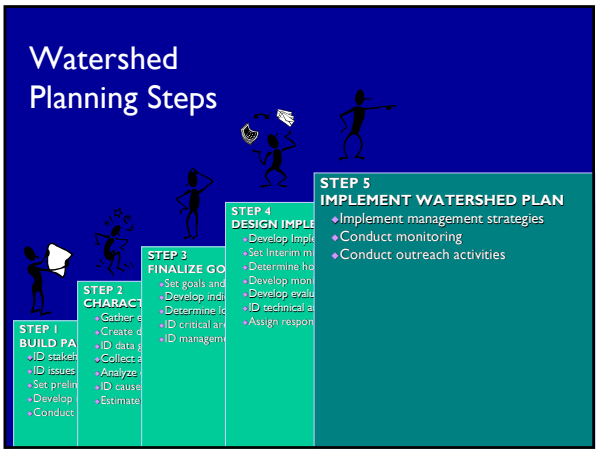
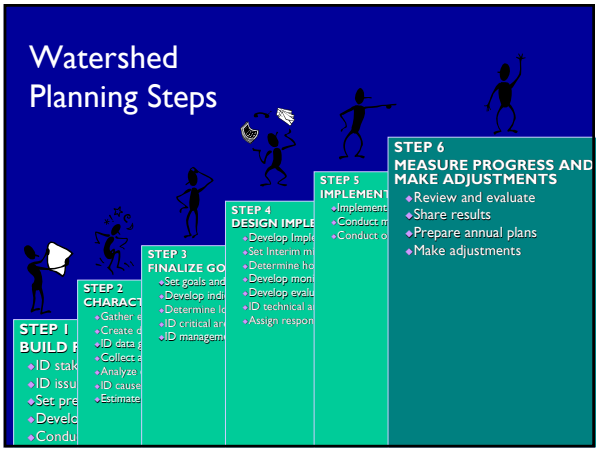
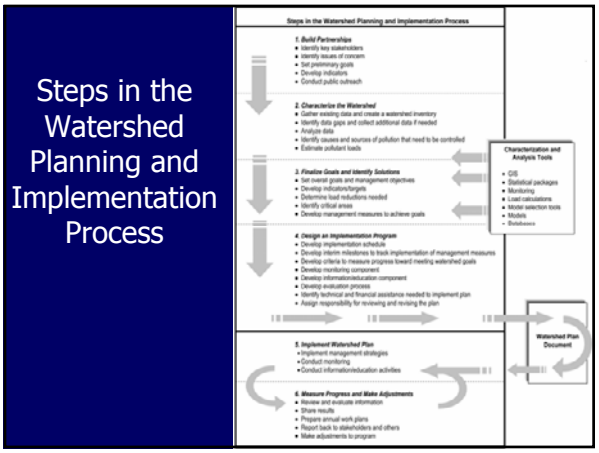
- Set prelim
- Develop
- Conduct


Watershed Planning Steps
STEP 5
IMPLEMENT WATERSHED PLAN
Implement management strategies
Conduct monitoring
Conduct outreach activities


Watershed Planning Steps
STEP 6
MEASURE PROGRESS AND MAKE ADJUSTMENTS
Review and evaluate
Share results
Prepare annual plans
Make adjustments


Steps in the Watershed Planning and Implementation Process

EPA's Nine Elements for Plans

a. Identify causes & sources of pollution
b. Estimate load reductions expected
c. Describe mgmt measures & targeted critical areas
d. Estimate technical and financial assistance needed
e. Develop education component
f. Develop schedule
g. Describe interim, measurable milestones
h. Identify indicators to measure progress
i. Develop a monitoring component

Source: US EPA, 2004 319 Supplemental Guidelines

EPA Nonpoint Source Guidelines

- Watershed plans needed to restore impaired waters & protect other waters
- Plans are required for projects funded with 319 incremental funds
- If TMDL exists, plan must incorporate TMDL load reductions
- If TMDL developed after plan, it must be amended to reflect TMDL load limits
- Plans should be designed to meet WQS
- Plans must include nine elements ("a-i")

319 Work Plans

- Can be designed to develop a watershed-based plan
  - Must ID watershed, include plan development schedule, estimate of funds needed to develop plan
- Watershed plans do not need to be submitted to EPA for approval
  - States must ID plans to be implemented, provide schedule, and estimate 319 funding needed

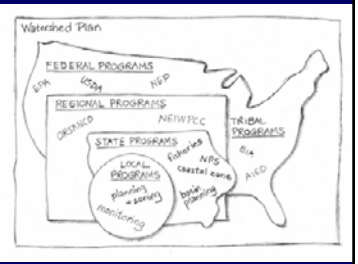
2. Characterize the Watershed
- Gather existing data and create a watershed inventory
- Identify data gaps and collect additional data if needed
- Analyze data
- Identify causes and sources of pollution that need to be controlled
- Estimate pollutant loads

3. Finalize Goals and Identify Solutions
- Set overall goals and management objectives
- Develop indicators/targets
- Determine load reductions needed
- Identify critical areas
- Develop management measures to achieve goals

Incorporation of the nine minimum elements

4. Design an Implementation Program
- Develop implementation schedule
- Develop interim milestones to track implementation of management measures
- Develop criteria to measure progress toward meeting watershed goals
- Develop monitoring component
- Develop information/education component
- Develop evaluation process
- Identify technical and financial assistance needed to implement plan
- Assign responsibility for reviewing and revising the plan

A watershed approach is designed to be a collaborative, adaptive, and iterative process



What is a stakeholder?

- A group or individual who:
  - has the responsibility for implementing the decision.
  - is affected by the decision.
  - has the ability to impede or assist in implementing the decision.

Why are stakeholders important to the process?

- Ensures that concerns are factored into the decisions made
- Shares the responsibility of the decision
- Enables partnerships to be formed to combine financial resources
- Shares implementation of the decision
- Establishes a framework for planning and conducting management activities

Why Teams Fail

- Past failures
- No commitment
- Worry about lost independence
- Lack of credit for contributions
- Personality conflicts
- Power struggles
- No agreement on roles and responsibilities
- Differences in cultural and personal values

Building Local Partnerships, CTIC

Keys to Team Success

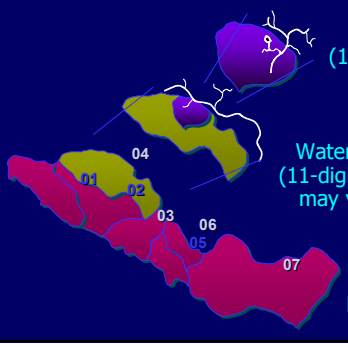
- Broad-based stakeholder involvement
- Credibility, fairness, & openness
- Overcoming mistrust and skepticism
- Strong leadership
- Commitment and involvement of high-level visible leaders

Key Principles in Designing a Stakeholder Process

- Legitimacy
- Accountability
- Inclusiveness
- Accessibility
- Adaptability

For best results, coordinate the watershed planning effort with other federal, state, and local activities

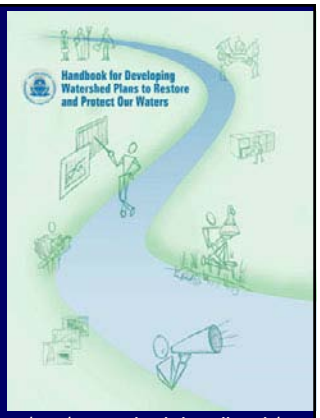
How large a planning area?



Identifying planning units

- Statewide mgmt unit designations
  - Requires support for coordination; may be laborious
  - Likely to require technical & other support
- Local/regional voluntary cooperatives
  - Depends on local collaborative efforts
  - Lots of local energy & commitment required
- Hybrid approach
  - State / tribe provides incentives for cooperation
  - Tech & other support available to interested groups

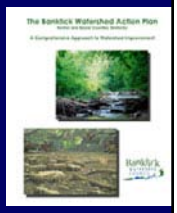
Watershed Planning Handbook



http://www.epa.gov/owow/nps/watershed_handbook/

Contents of a Watershed Plan

- Introduction
  - Plan area & description, partners, background
- Water quality information & analysis
  - WQ goals, monitoring/assessment results
  - Key pollutants / stressors, sources, current loads
- Proposed management measures
  - Load reductions needed, BMP types proposed
  - Reductions expected from BMPs, installation sites
- Implementation plan
  - Public info/education & outreach/involvement plan
  - BMP/$$/TA support sources, project schedule & costs
- Monitoring and adaptive management approach
  - Interim measurable milestones, load reduction criteria
  - Evaluation framework, monitoring plan & partners



Introduction

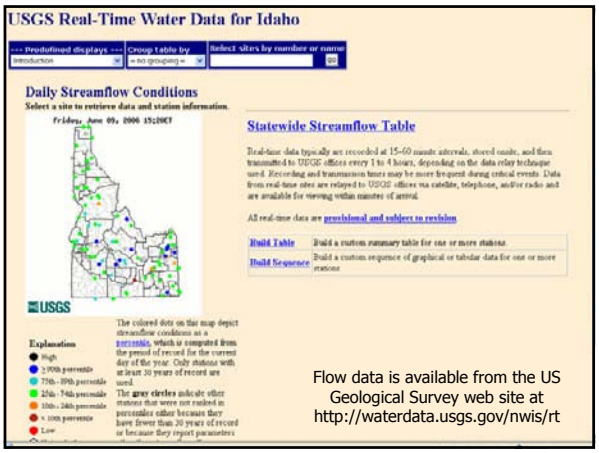
- Geographic area
  - Basis for selection
- Watershed inventory
  - Physical description
  - Climate
  - Geology
  - Hydrology
  - Soils
  - Biota
  - Land cover & uses
  - Resources & recreation
  - Programmatic infrastructure
  - Economic, social, cultural and historic background
- Partners

Water quality info & analysis

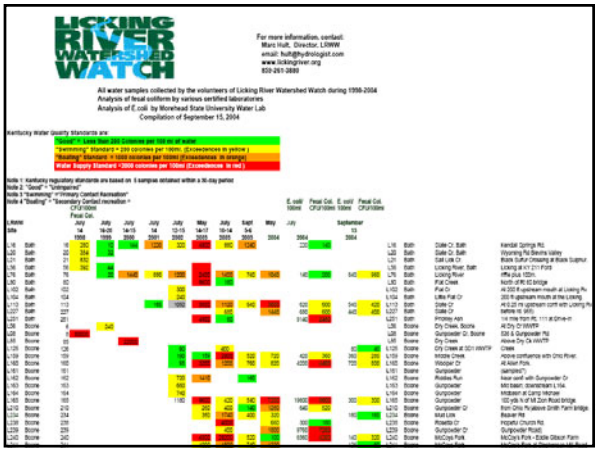
- Water quality goals
  - Designated uses, WQ criteria
  - Restoration and protection goals
  - Flooding, aesthetics, others???
- Monitoring and assessment results
  - Desktop data mining, local monitoring results
  - ID impaired & threatened waters
- Key pollutants / stressors
  - Check 303(d); local monitoring/assessment
- Pollutant sources
  - From 303(d) or other assessment
- Current loads
  - Estimate, model, or otherwise quantify

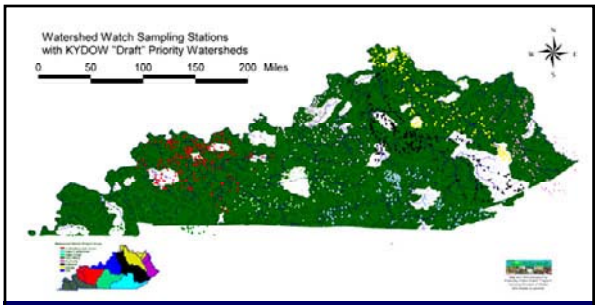
Types of Data for Watershed Characterization

- **Physical and Natural Features**
  - Watershed boundaries
  - Hydrology
  - Topography
  - Soils
  - Climate
  - Habitat
  - Wildlife
- **Land Use and Population Characteristics**
  - Land use and land cover
  - Existing management practices
  - Demographics
- **Waterbody Conditions**
  - Water quality standards
  - 305(b) report
  - 303(d) list
  - TMDL reports
  - Source Water Protection Areas
- **Pollutant Sources**
  - Point sources
  - Nonpoint sources
- **Waterbody Monitoring Data**
  - Water quality data
  - Flow data
  - Biological data



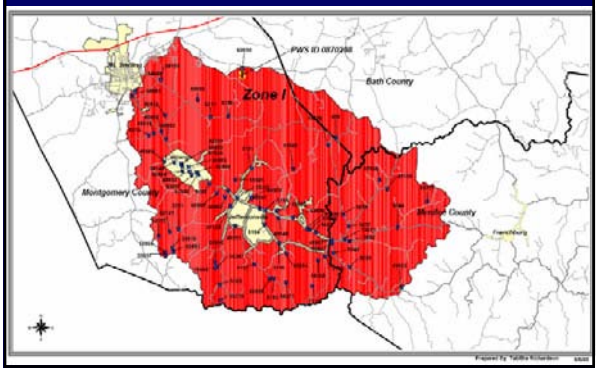
Flow data is available from the US Geological Survey web site at http://waterdata.usgs.gov/nwis/rt

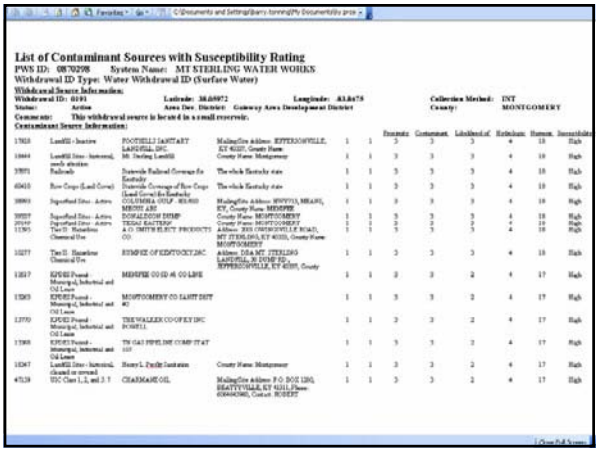




Criteria	Big Sandy	Licking	Cumber-land	KY	Salt	Up Green	Trade-water	Four Riv.	Statewide
Organized	1999	1998	1999	1997	1998	2000	2000	1999	1999
# Volunteers Registered	147	292	177	315	434	143	195	161	1864
# Sites Sampled	138	247	253	351	187	179	279	177	1811
2005 "Active" sites	111	117	96	246	102	111	200	86	1069
07/05 samples delivered	60	111	72	136	88	85	77	73	712

Source Water Protection Map for Slate Creek (Montgomery County)





List of Contaminant Sources with Susceptibility Rating

PWS ID: 0870298 System Name: MT STERLING WATER WORKS

Withdrawal ID Type: Water Withdrawal ID (Surface Water)

Sample Data Sources

- Watershed Coverages:
  - 8-digit: http://water.usgs.gov/GIS/huc.html
  - 14-digit: www.ncgc.nrcs.usda.gov/products/datasets/watershed
  - EPA Reach Files - 3 versions RF1, RF2, RF3-Alpha (most detailed)
  - www.epa.gov/waterscience/ftp/basins/gis_data/huc/
- Elevation Data
  - USGS: http://edc.usgs.gov/geodata
  - GIS data http://data.geocomm.com
- Land Use/Population
  - USGS: http://edc.usgs.gov/geodata
  - EPA: www.epa.gov/nrlc/nlcd.html
- BLM Management Plans
  - www.blm.gov/planning/plans.html

Other Data Sources

- State 303 (d) lists and TMDL reports
  - www.epa.gov/owow/tmdl
- Point source discharge permits
  - www.epa.gov/enviro/html/pcs/index.html
- Agricultural Statistics
  - http://www.nass.usda.gov/index.asp
- Septic tank use
  - http://quickfacts.census.gov/

Identifying stressors and sources

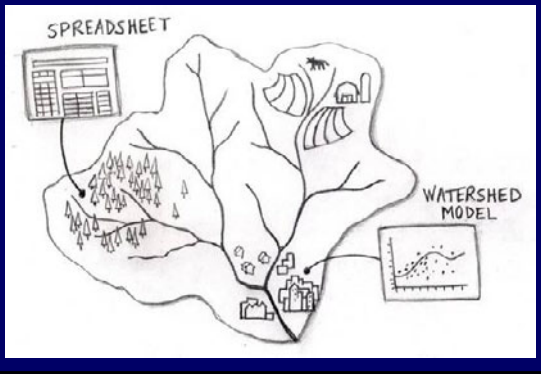
- Identify specific causes & sources of water quality impairments or threats
  - Examples: metals / acidity from X number of abandoned mine lands, sediment & high flows from urban runoff, sediment from construction sites, habitat loss from channelization, etc.
- Quantify or estimate pollutant sources requiring controls
  - Examples: # of miles of pasture streams needing fencing; number of mine sites needing treatment with estimates and general profiles of flows, etc.
  - Can "bundle" stressors and/or sources
    - All pasture cattle operations, all development sites
    - All sources of sediment, all sources of phosphorus

Supplementing available data

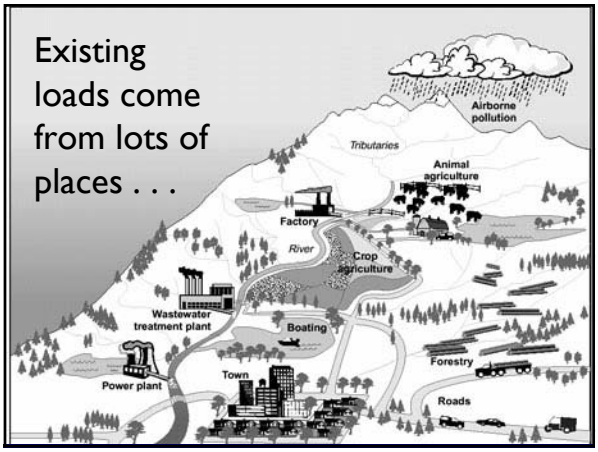
- Windshield surveys
- Interviews with residents
- Volunteer monitoring
- Bioassessment
- Targeted sampling
- Chemical/biological sampling

Helps lay the groundwork for implementation!

How can we estimate loads?



Existing loads come from lots of places . . .



Existing loads come from:

- Point-source discharges (NPDES facilities)
  - Info is available on the discharges (DMRs, etc.)
  - Some are steady-flow, others are precip-driven
- Nonpoint sources (polluted runoff)
  - All are (mostly) precip-driven
  - Calculating the "wash-off, runoff" load is tough
  - Literature values can be used to estimate
  - Modeling gets you closer . . . . do you need it?
- Air / atmospheric deposition
  - Can be significant in some locations

Table 2-2. Summary of Common Pollutants and Sources

Pollutant	Potential Sources		Impacts on Waterbody Uses
	Point Sources	Nonpoint Sources	
Pathogens	• WWTPs • CSOs/SSOs • Permitted CAFOs • Discharges from meat processing facilities • Landfills	• Animals (domestic, wildlife, livestock) • Malfunctioning septic systems • Pastures • Boat pumpout facilities • Land application of manure • Land application of wastewater	• Primarily human health risks • Risk of illness from ingestion or from contact with contaminated water through recreation • Increased cost of treatment of drinking water supplies • Shellfish bed closures
Metals	• Urban runoff • WWTPs • CSO/SSOs • Landfills • Industrial facilities • Mine discharges	• Abandoned mine drainage • Hazardous waste sites (unknown or partially treated sources) • Marinas	• Aquatic life impairments (e.g., reduced fish populations due to acute/chronic concentrations or contaminated sediment) • Drinking water supplies (elevated concentrations in source water) • Fish contamination (e.g., mercury)
Nutrients	• WWTPs • CSOs/SSOs • CAFOs • Discharge from food- processing facilities • Landfills	• Cropland (fertilizer application) • Landscaped spaces in developed areas (e.g., lawns, golf courses) • Animals (domestic, wildlife, livestock) • Malfunctioning septic systems • Pastures • Boat pumpout • Land application of manure or wastewater	• Aquatic life impairments (e.g., effects from excess plant growth, low DO) • Direct drinking water supply impacts (e.g., dangers to human health from high levels of nitrates) • Indirect drinking water supply impacts (e.g., effects from excess plant growth clogging drinking water facility filters) • Recreational impacts (indirect impacts from excess plant growth on fisheries, boat/swimming access, appearance, and odors) • Human health impacts

Pollutant	Potential Sources		Impacts on Waterbody Uses
	Point Sources	Nonpoint Sources	
Sediment	• WWTPs • Urban stormwater systems	• Agriculture (cropland and pastureland erosion) • Silviculture and timber harvesting • Rangeland erosion • Excessive streambank erosion • Construction • Roads • Urban runoff • Landslides • Abandoned mine drainage • Stream channel modification	• Fills pools used for refuge and rearing • Fills interstitial spaces between gravel (reduces spawning habitat by trapping emerging fish and reducing oxygen exchange) • When suspended, prevents fish from seeing food and can clog gills; high levels of suspended sediment can cause fish to avoid the stream • Taste/odor problems in drinking water • Impairs swimming/boating because of physical alteration of the channel • Indirect impacts on recreational fishing
Temperature	• WWTPs • Cooling water discharges (power plants and other industrial sources) • Urban stormwater systems	• Lack of riparian shading • Shallow or wide channels (due to hydrologic modification) • Hydroelectric dams • Urban runoff (warmer runoff from impervious surfaces) • Sediment (cloudy water absorbs more heat than clear water) • Abandoned mine drainage	• Causes lethal effects when temperature exceeds tolerance limit • Increases metabolism (results in higher oxygen demand for aquatic organisms) • Increases food requirements • Decreases growth rates and DO • Influences timing of migration • Increases sensitivity to disease • Increases rates of photosynthesis (increases algal growth, depletes oxygen through plant decomposition) • Causes excess plant growth

Note: WWTP = wastewater treatment plant; CSO = combined sewer overflow; SSO = sanitary sewer overflow; CAFO = concentrated animal feeding operation; DO = dissolved oxygen.

Nonpoint source: precip-driven
(this may be a point source in some cases!)

Table 9. Unit loads of pollutants (kg/ha/yr) from different land uses*

Pollutant	Central business district	Other commercial	Industrial	Single family res.	Multi-family res.	Cropland	Pasture	Forest	Open
TSS	1080	840	56	17	440	450	340	85	7
COD	1070	1020	63	28	330	n.a.	n.a.	n.a.	2.0
Pb	7.1	3.0	2.0 - 7.1	0.1	0.7	0.005 - 0.006	0.003 - 0.015	0.01 - 0.03	n.a.
Zn	3.0	3.3	3.5 - 12	0.22	0.33	0.03 - 0.08	0.02 - 0.17	0.01 - 0.03	n.a.
Cu	2.1	n.a.	0.33 - 1.1	0.03	0.33	0.01 - 0.06	0.02 - 0.04	0.02 - 0.03	n.a.
NO_3+$N0_2$-N	4.5	0.67	0.45	0.33	3.8	7.9	0.33	0.56	0.33
TKN	15	15	2.2 - 15	1.1 - 5.6	3.4 - 4.5	1.7	0.67	2.9	1.7
TP	2.8	2.7	0.9 - 4.0	0.2 - 1.5	1.3 - 1.6	0.1 - 3.0	0.07 - 3.0	0.02 - 0.45	0.06

* Exact values are given where available; otherwise ranges are reported.

Adapted from Horner et al. (1986)

What is a "load?"

- Maybe measured by weight . . .
  - Kilograms per day
  - Pounds per week
  - Tons per month
- Maybe not . . .
  - Concentration-based expression of the "load" (e.g., milligrams per liter)
    - mg/L x L/day = mg/day [C = m/v]
  - # of miles of streambank needing stabilization or vegetation
  - # of AFOs requiring nutrient plans
  - % of urban area to be 'perforated'

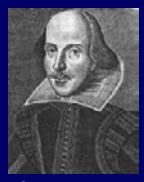
Identification of causes & sources

- What "pollutants" are you dealing with?
  - Chemical or other stressors or causes of impairment
- How big is the problem for each?
- How do you know?
  - Did you "measure" them?
  - Did you estimate? How?
- Where are they coming from?
  - Can you put the info on a map?
- Can you estimate the % from each source?

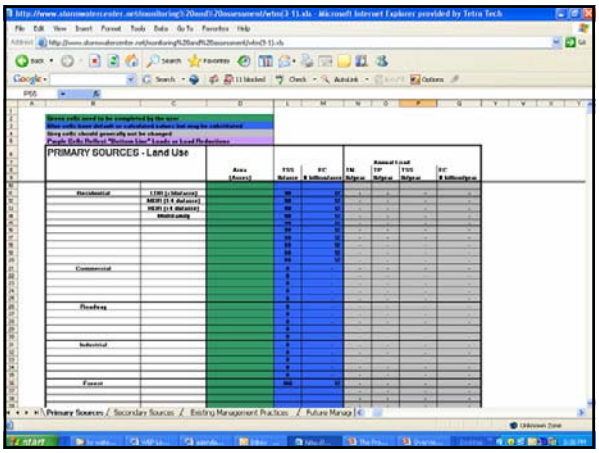
Reducing loads: the basics

- Simple (linear) approach
  - Use observed data
  - Empirical relationships
  - Reduce the concentration
  - Reduce the source area
  - Reduce # of sources
- Complex (modeled) approach
  - Model the loadings
  - Model BMP reductions
  - Layers can include topography, soils, climate, land use, land cover, pollutant transport/fate, point sources, management practices, etc.

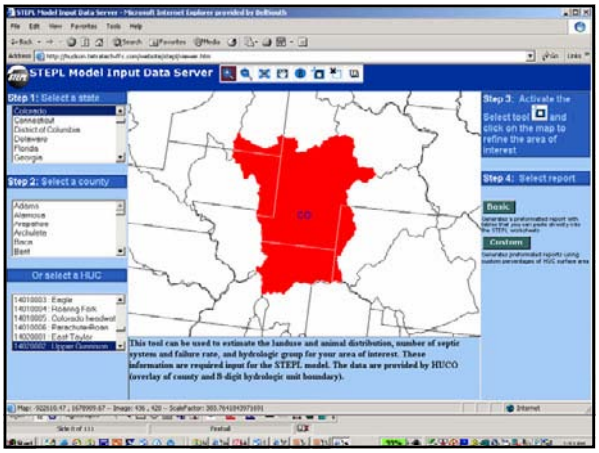
To model, or not to model . . .

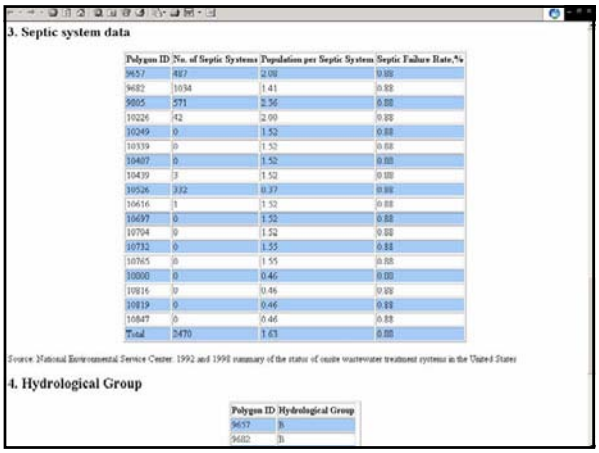


- As these things increase:
  - Number of pollutants
  - Complexity of loads/stressors
  - Uncertainty regarding existing information
  - Expense involved in addressing problems
- The need for more sophisticated modeling also increases


PRIMARY SOURCES - Land Use


U.S. Environmental Protection Agency
STEPL - Spreadsheet Tool for Estimating Pollutant Load
Welcome to STEPL
http://it.tetratech-ffx.com/stepl


STEPL Model Input Data Server
Step 1: Select a state
Step 2: Select a county
Or select a HUC
Step 3: Activate the
Step 4: Select report
Basic
Custom
This tool can be used to estimate the landuse and animal distribution, number of septic system and failure rate, and hydrologic group for your area of interest. These information are required input for the STEPL model. The data are provided by HUCO (overlay of county and 8-digit hydrologic unit boundary).



3. Septic system data

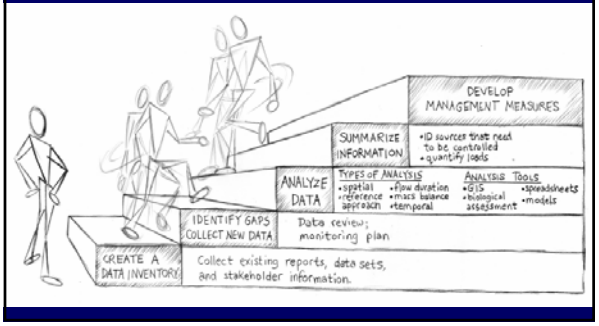
Polygon ID	No. of Septic Systems	Population per Septic System	Septic Failure Rate,%
9657	487	2.09	0.88
9682	1034	1.41	0.88
9805	571	2.56	0.88
10226	42	2.09	0.88
10249	0	1.52	0.88
10339	0	1.52	0.88
10407	0	1.52	0.88
10439	3	1.52	0.88
10526	332	0.37	0.88
10616	1	1.52	0.88
10697	0	1.52	0.88
10704	0	1.52	0.88
10732	0	1.55	0.88
10765	0	1.55	0.88
10800	0	0.46	0.88
10816	0	0.46	0.88
10819	0	0.46	0.88
10847	0	0.46	0.88
Total	2470	1.63	0.88

Source: National Environmental Service Center. 1992 and 1998 summary of the status of onsite wastewater treatment systems in the United States

4. Hydrological Group

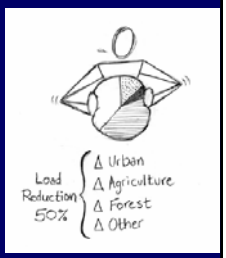
Polygon ID	Hydrological Group
9657	B
9682	B

Watershed analysis is on ongoing learning process – iterative & creative!



Proposed management measures

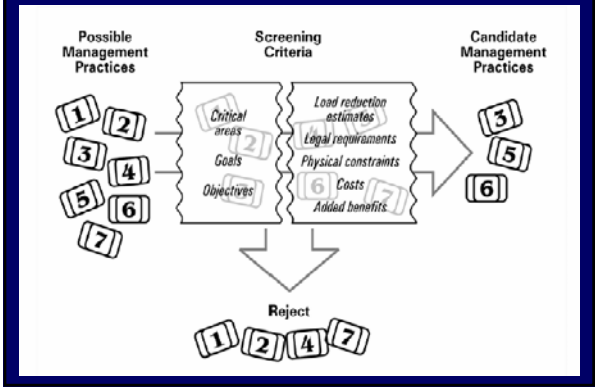
- Load reductions needed
  - Estimate quantitatively
  - Metrics selected should make sense!
- BMP types proposed
  - What will lessen your 'loads'?
  - Applicable to your situation?
- Load reductions from BMPs
  - How can you measure BMP impacts?
  - Use literature or actual values
- BMP installation sites
  - Which sites will hit the source(s)?
  - Are there critical areas to focus on?



Examples of Different Scenarios to Meet the Same Load Target

Source	Existing Phosphorus Loading (kg/y)	Scenario 1		Scenario 2	
		% Load Reduction	Allowable Load (kg/y)	% Load Reduction	Allowable Load (kg/y)
Roads	78	26	58	20	62
Pasture/Hay	21	26	16	10	19
Cropland	218	26	162	55	98
Forest	97	26	72	0	97
Landfill	7	26	5	0	7
Residential	6	26	5	0	6
Groundwater	111	26	83	0	111
Total	539	26	400	26	400

Identify candidate practices



Select the most appropriate BMPs

- Look at what's worked and what hasn't
- Research effectiveness
- Consider costs/benefits
- Property ownership/site access
- Look for added benefits
- Use a combination of techniques
- Focus efforts on critical areas; use more or better BMPs there

Prioritizing/targeting BMPs

- Importance of waterbody
  - Drinking water source, recreational resource
- Magnitude of impairment(s)
  - Level of effort needed; public interest/attention
- Existing loads (stressors & sources)
  - Magnitude, spatial variation, clustering
- Ability of BMPs to reduce loads
  - Sure thing, or a shot in the dark?
- Feasibility of implementation
  - Willing partners? Public support?
- Additional benefits
  - Recreational enhancements, demonstration

References for determining BMP effectiveness

- Stormwater/Urban (BMP Effectiveness database; Menu of BMPs)
- Agriculture (Ag Management Measure document)
- Forestry (Forestry Management Measures document)
- Mining (Development document for proposed Effluent Guideline for Mining)

www.epa.gov/nps

www.epa.gov/owow/nps/agmm/index.html

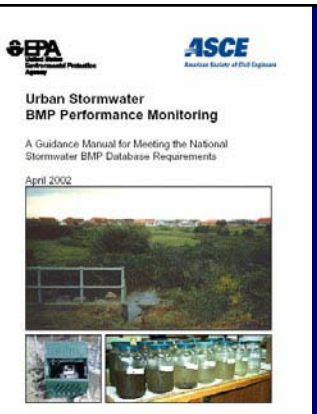
www.epa.gov/owow/nps/agmm/ index.html

Table 4d-5. Relative gross effectiveness[a] (load reduction) of animal feeding operation control measures (Pennsylvania State University, 1992b).

Practice[b] Category	Runoff Volume	Total[d] Phosphorus (%)	Total[d] Nitrogen (%)	Sediment (%)	Fecal Coliform (%)
Animal Waste Systems[e]	reduced	90	80	60	85
Diversion Systems[f]	reduced	70	45	NA	NA
Filter Strips[g]	reduced	85	NA	60	55
Terrace System	reduced	85	55	80	NA
Containment Structures[h]	reduced	80	65	70	90

NA = not available.
[a] Actual effectiveness depends on site-specific conditions. Values are not cumulative between practice categories.
[b] Each category includes several specific types of practices.
[d] Total phosphorus includes total and dissolved phosphorus; total nitrogen includes organic-N, ammonia-N, and nitrate-N.
[e] Includes methods for collecting, storing, and disposing of runoff and process-generated wastewater.
[f] Specific practices include diversion of uncontaminated water from confinement facilities.
[g] Includes all practices that reduce contaminant losses using vegetative control measures.
[h] Includes such practices as waste storage ponds, waste storage structures, waste treatment lagoons.

www.bmpdatabase.org/docs.htm



http://www.epa.gov/owow/nps/forestrymgmt/

http://www.epa.gov/owow/nps/agmm/index.html

Sample BMP effectiveness table

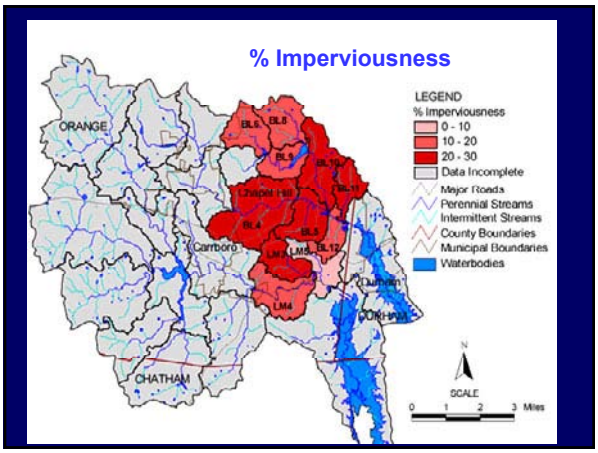
Table 6-3. BMPs and removal efficiencies used in Site Evaluation Tool BMP percent efficiency

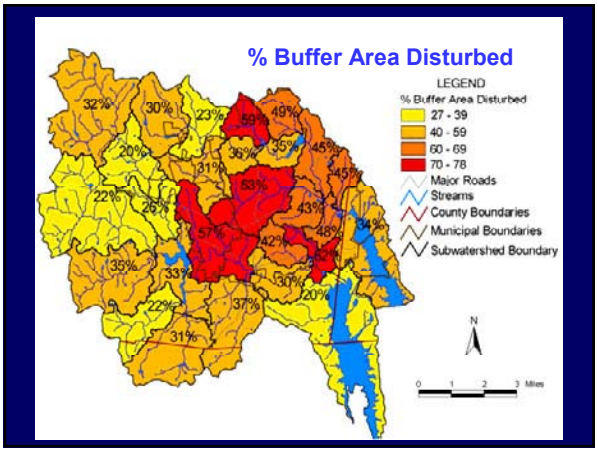
BMP	Percent Efficiency			
	TSS	Total Nitrogen	Total Phosphorus	Fecal Coliform
Wet pond	85[a]	33[a]	51[a]	70[a]
Dry detention	47[a]	25[a]	19[a]	78[a]
Stormwater wetland	76[a]	30[a]	49[a]	78[a]
Sand filter	87[a]	32[a]	59[a]	37[a]
Bioretention	87[a,j]	57[a,h]	76[a,h,i]	90[a]
Enhancedg Grass swale	93[a]	92[a]	83[a]	- 25[a]
Grass swale	68[a]	20[a]	29[a]	5[a]
Infiltration trench	95[a]	51[a]	70[a]	90[a]
25-ft forest buffer	57[b,c]	27[b,c]	34[b,c]	5[a]
50-ft forest buffer	62[b,c]	31[b,c]	38[b,c]	5[a]
75-ft forest buffer	65[b,c]	33[b,c]	41[b,c]	5[a]
100-ft forest buffer	67[b,c]	34[b,c]	43[b,c]	5[a]
200-ft forest buffer	72[b,c]	38[b,c]	47[b,c]	5[a]

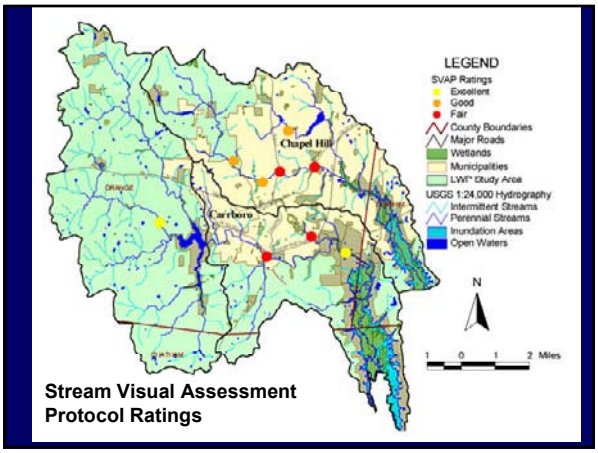
[a] Winer, R. 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices, 2nd ed. Center for Watershed Protection, Ellicott City, MD.

What should we monitor?

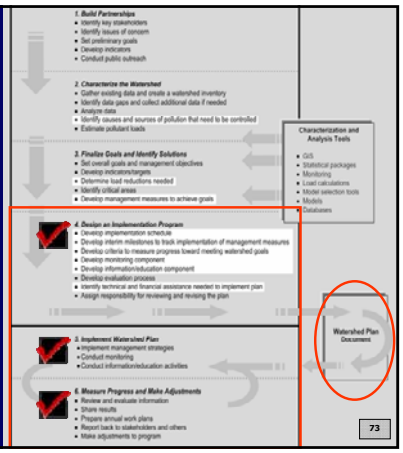
- Indicators that:
  - Characterize the watershed
  - Define and/or refine your understanding of the problem(s), such as water quality criteria violations, etc.
  - Show changes in targeted water quality or habitat conditions
  - Efficiently provide effective management information


% Imperviousness
LEGEND
% Imperviousness
0 - 10
10 - 20
20 - 30
Data Incomplete
Major Roads
Perennial Streams
Intermittent Streams
County Boundaries
Municipal Boundaries
Waterbodies
ORANGE
Chapel Hill
Carrboro
Durham
CHATHAM
SCALE
0 1 2 3 Miles


% Buffer Area Disturbed
LEGEND
% Buffer Area Disturbed
27 - 39
40 - 59
60 - 69
70 - 78
Major Roads
Streams
County Boundaries
Municipal Boundaries
Subwatershed Boundary
0 1 2 3 Miles


LEGEND
SVAP Ratings
Excellent
Good
Fair
County Boundaries
Major Roads
Wetlands
Municipalities
LWP Study Area
USGS 1:24,000 Hydrography
Intermittent Streams
Perennial Streams
Inundation Areas
Open Waters
Chapel Hill
Carrboro
1 0 1 2 Miles
Stream Visual Assessment Protocol Ratings

Assigning tasks, implementing actions, and monitoring progress



Implementation Plan

- Public information & education
- Outreach and involvement
- Support for:
  - BMPs
  - $$$$
  - Technical Assistance
- Project schedule
- Project costs

Asking the right questions . . .

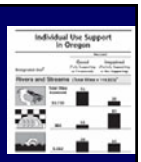
- Who can help implement the BMPs or controls?
  - Agencies, businesses, non-profits, citizens, producers
- How can they be implemented?
  - What has been done in the past?
  - How well did it work?
  - Can we do it (or adapt it) here?
- When can we get started?
  - Reasonable short-term actions
  - Long-term or major actions
- How do we know if it's working?
  - And what do we do if it's not?

Identify sources of support

- Funding sources
  - Grants, contracts, donations
  - Supplemental Env. Projects
- Sources of technical assistance
  - Internal and external
- Regulatory or other authority
  - Health dept. planning/zoning
  - WHPP, SWPP, etc.
- Matching support sources
  - Be creative!

Developing info/ed activities

- Define overall goal and objectives
- Identify and characterize target audience
- Create message(s) for target audience(s)
- Package the messages for distribution
- Distribute messages to the audiences
- Evaluate the information/education effort



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Prioritizing management efforts

- Integrate assessment results across objectives
- Example factors to consider:
  - Highest threats to achieving objectives
  - Regulatory requirements
  - Where are existing management regulations, programs, policies, practices falling short
  - Stakeholder preferences


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Setting times and targets

- Develop implementation schedule
  - Think about short term (< 2 yrs) and long-term (> 5 yrs) goals
- Determine how you will measure success
  - What indicators are linked to the problems you're dealing with?
- Set interim milestones
  - What helps to show progress?
  - Can be both water quality & programmatic indicators

Establish indicators & targets for management objectives

INDICATOR = measurable parameter used to evaluate relationship between pollutant sources and environmental conditions

TARGET = value of indicator that is set as the goal to achieve

Other types of indicators

- Environmental Indicators:
  - # of occurrences of algal blooms
  - miles of streambank restored or fenced off
  - % increase in "healthy-stream" critters
  - Increase in DO
  - # of waterbodies restored
- Administrative/programmatic indicators
  - # of BMPs installed
  - # of newspaper stories printed
  - # of people educated/trained
  - # of public meetings held
  - # of volunteers attending activities
  - # of storm drains stenciled

Monitoring and adaptive management

- Interim measurable milestones
  - Load reduction targets
- Monitoring component
  - Who will help with monitoring?
  - Measuring your chosen indicators
- Develop evaluation framework
  - Indicator targets vs. collected data

Example milestones

- Short-term (<1 yr)
  - Achieve 25% reduction in sediment load on 1,000 acres of ag land in the Cross Creek watershed by implementing rotational grazing practices.
- Mid-term (1-4 yrs)
  - Reduce streambank erosion and sediment loading rate by 30% by reestablishing vegetation along 3,600 feet of Cross Creek.
- Long-term (>5 yrs)
  - Restore upper reaches of 6 tributaries and create buffer easements along 15,000 ft of Cross Creek feeder streams.

The watershed plan is done . . .

Now the real work begins!

Table 8-2. Comparison of example parameters in a hypothetical watershed plan and 319 work plan

Parameter	Lake Lehmann Watershed Management Plan	319 Work Plan #1
Period	2003 -2013	2003 - 2006
Geographic scope	180,000 acres	24,000 acres
Goal statement	Improve watershed conditions to support a sustainable fisheries	Reduce sediment loadings from priority subwatershed XY
Example objectives and key elements	• Increase the index of biological integrity from 30 to 75 • Identification of causes and sources of sediment • Identification of load reduction expected • Identification of management practices needed • Identification of critical areas	• Treat 5,000 acres of cropland with crop residue management (CRM) practices • Six terraces to treat 1,200 acres • Five buffer strips established for a total of 8,000 feet
Implementation	• CRM: 2,000 acres of row crop/year into CRM • Terraces: 4 fields/year, 40 fields total • Buffers: restore 1 to 1.5 miles of riparian area/year – 8 miles total • Field buffers: 100 fields total	• Develop training materials on CRM in year 1 • Hold 2 workshop each in years 2 and 3 • 2 terraces/year • 1 buffer strip in first year and 2 each in years 2 and 3
Costs	$4,020,000 over 10 years • $800,000 for information and education (I&E) • $600,000 for monitoring and reporting • $1,980,000 for buffers (18,000 acres at $110 / acre) • $140,000 for 40 terraces • $500,000 for CRM	$250,000 over 3 years • $50,000 to prepare training materials and give 5 workshops on CRM • $160,000 for BMP cost sharing • $40,000 for monitoring and reporting
Schedule	• Begin slowly and accelerate (build on successes) • Establish interim milestones • Cropland: 2008 – reduce soils erosion by 80,000 tons/year	• See above • Annual progress reports

Who will implement the plan?

Structure can vary widely

- Public agencies
  - Tribes, cities, counties
  - Water or wastewater utility
  - State agency or river authority
  - Basin planning teams
- Private entities
  - Watershed association
  - Ag producer council

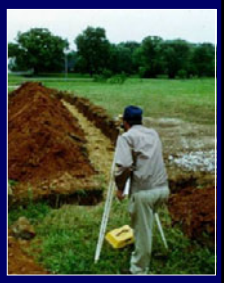
Any well-organized single or multiple entity approach can coordinate and document the effort

Coordinate with other water resource and land use programs

- Section 303, Water Quality Standards, TMDLs
- Section 319, NPS Program
- Section 402, NPDES Permits, CAFOs, Stormwater I & II
- Source Water Protection Plans – local water utilities
- Wetlands Protection Programs
- EQIP, CRP, BLM, USFS, USFWS
- More…

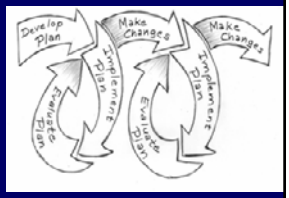
During implementation, remember:

- Plans are guides, not straitjackets
- Be aware of unforeseen opportunities
- Picking the low-hanging fruit is easy, but it helps to build a sense of progress & momentum
- If possible, work quietly for as long as you can on the most contentious issues



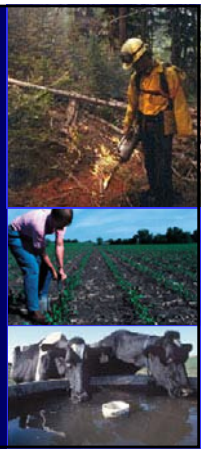
Finally…Make Adjustments

- Monitor water quality and BMPs
  - Compare results to goals
  - Are you making progress?
  - Are you meeting your goals?
- If you aren't meeting implementation milestones
- If you aren't making progress toward reducing pollutant loads….



The Bottom Line:

- Load reduction *estimates* are critical for nonpoint sources
- Preliminary info & estimates can be modified & corrected over time, if necessary
- NPS 319 - funded management measures should proceed only after reasonable estimates are made of how far they will go towards achieving water quality targets.



Stepping through a watershed plan

- a. Identify causes & sources of pollution
- b. Estimate load reductions expected
- c. Describe mgmt measures & targeted critical areas
- d. Estimate technical and financial assistance needed
- e. Develop education component
- f. Develop schedule
- g. Describe interim, measurable milestones
- h. Identify indicators to measure progress
- i. Develop a monitoring component

Source: US EPA, 2004 319 Supplemental Guidelines